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DEVELOPMENTS IN EASTERN INTERIOR BASIN IN 1941¹

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ABSTRACT

More wells were drilled in 1941 in Illinois and southwestern Indiana than in any previous year except 1907 when drilling reached a peak in that area. Drilling declined in western Kentucky, making the total number of completions in the Eastern Interior basin in 1941 slightly less than in 1940. Much of the 1941 drilling (both pool and wild-cat) was concentrated in the deep-basin area in the region of the lower Wabash River in Illinois and Indiana where 44 new pools and 43 extensions were discovered. None of the new pools was of major size and the total output of new wells in the whole area failed to offset the decline of the older wells. Total production from the Eastern Interior basin in 1941 is estimated at 145,603,000 barrels as compared with 154,796,000 barrels in 1940, a decline of 6 per cent. Percentage of the national total was 10.3 in 1941 as compared with 11.5 in 1940.

Rocks of the Mississippian system continue to yield most of the oil in the area—91.5 per cent of the Illinois total of 133,750,000 barrels in 1941. No new Devonian production was discovered in Illinois in 1941 and the Devonian wells, which yielded an estimated 26 per cent of the Illinois total in 1940, produced only 6 per cent of the total in 1941. Pennsylvanian and Ordovician strata yielded estimated amounts of 1.7 and 0.9 per cent, respectively. Geologic studies indicate that lenticular sand conditions are important in controlling the occurrence of the oil.

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INTRODUCTION

Much drilling, both pool and wildcat, many new discoveries, but no major pools, and a 6 per cent decline in production from the previous year, were features of the 1941 record of the oil industry in the Eastern Interior basin. Drilling increased slightly in Illinois and southwestern Indiana but declined in Kentucky, resulting in a slight decline for the whole basin. The following table compares the amount of drilling in 1940 and 1941.

	<i>Number of Completed Wells</i>	
	<i>1940</i>	<i>1941</i>
Illinois	3,829	3,838
Southwestern Indiana	450	463
Western Kentucky	<u>401</u>	<u>314</u>
Total for basin	4,680	4,615

Total oil production from the Eastern Interior basin in 1941 is estimated at 145,603,000 barrels as compared with 154,796,000 barrels in 1940. The 1941 production was 10.3 per cent of the total for the United States as compared with 11.5 per cent in 1940.



FIG. 1.—Index map of the Eastern Interior basin and of Illinois basin (deep part of Eastern Interior basin).

ILLINOIS

EXPLORATORY DRILLING

A total of 591 wildcat wells were drilled in Illinois in 1941, of which 44 discovered new pools and 40 discovered extensions, that is, 1 wildcat well in 7 was successful. Nearly all of this drilling was in the southern half of the state. The distribution of the wildcat drilling in 1941 with respect to the Illinois basin (deep part of the Eastern Interior basin) is shown in Figure 2 and Table I.

It may be seen in Table II that nearly all of the 1941 discoveries were in formations of Mississippian age. The pools discovered in Pennsylvanian and Devonian formations were small. There was some development in the Devonian limestone in the Loudon pool—59 producing wells by the end of the year. The discovery well for Devonian production in the Loudon pool was drilled in 1937, but further de-

TABLE I
DISTRIBUTION OF ILLINOIS WILDCAT WELLS

	<i>No. of Wildcat Wells</i>	<i>No. of New Pools</i>	<i>No. of Extensions</i>
Illinois basin counties	356	34	37
Marginal counties	158	9	3
Outside counties	77	1	0
Total	591	44	40

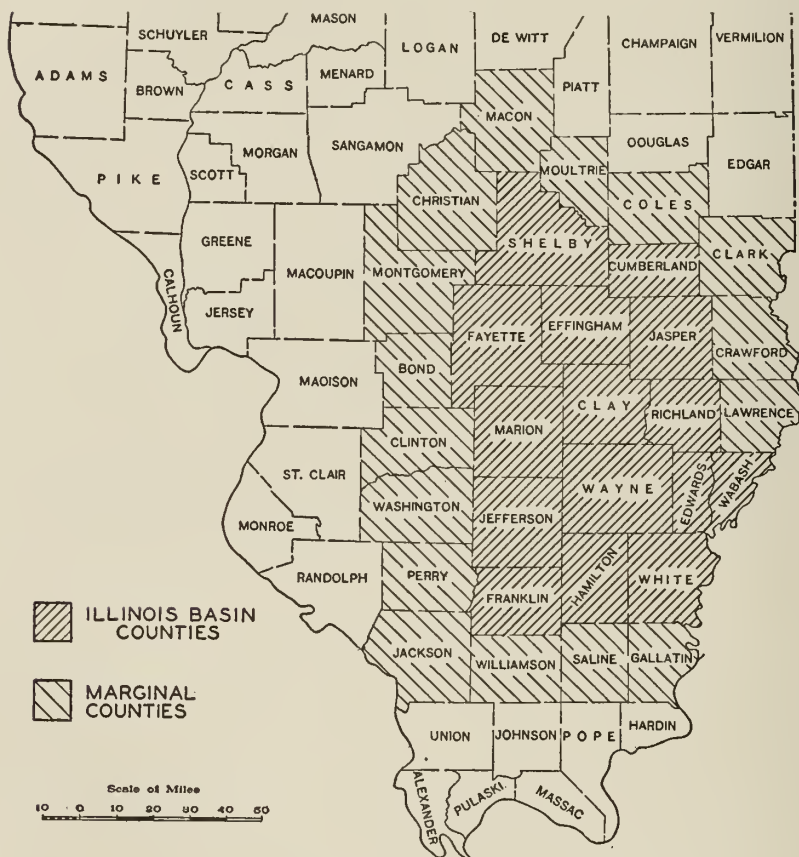


FIG. 2.—Map showing distribution of Illinois wildcat drilling and discoveries in 1941 with respect to Illinois basin.

development did not take place until 1941. During 1941, largely during the first 6 months, 99 Devonian wells in the Salem pool were deepened to the "Trenton" limestone in the Ordovician system.

Mississippian formations continue to yield most of the oil in Illinois—an estimated 91.5 per cent in 1941. The Devonian limestone, which produced an estimated 26 per cent of the Illinois total in 1940, produced only about 6 per cent of the total in 1941. Pennsylvanian and Ordovician strata yielded estimated amounts of 1.7 and 0.9 per cent respectively during 1941.

TABLE II
GEOLOGICAL DISTRIBUTION OF DISCOVERIES IN ILLINOIS IN 1941

<i>System or Series</i>	<i>Formation or "Sand"</i>	<i>No. of New Pools</i>	<i>No. of Extensions</i>	<i>Total No. of Discoveries</i>
Pennsylvanian	(Unnamed)	1		1
Pennsylvanian	Buchanan	2		2
Upper Miss. (Chester)	Palestine	2		2
Upper Miss. (Chester)	Waltersburg	1	1	2
Upper Miss. (Chester)	Tar Springs	4	7	11
Upper Miss. (Chester)	Cypress	4	4	8
Upper Miss. (Chester)	Paint Creek		2	2
Upper Miss. (Chester)	Bethel	4	8	12
Upper Miss. (Chester)	Aux Vases	6	5	11
Lower Miss. (Iowa)	Rosiclare	2		2
	Fredonia			
	"McClosky"	17	14	31
Devonian		1*		1
		—	—	—
		44	41	85**

* Gas well, shut in.

** One well, discovering an extension of the Clay City pool, is producing from two sands, the Cypress and Bethel, making the total of discovery wells 84 instead of 85.

GEOLOGIC FEATURES REVEALED BY NEW DRILLING

Structural and stratigraphic studies now in progress indicate that the amount of closure on top of the Glen Dean limestone for many of the new pools discovered in 1941 is small. The lensing-out of the oil sand determines the updip boundary of the producing area in some instances, one of which is described in another paper on this program. The Johnsonville pool, the largest new pool developed during the year, is located on a dome of about 100 feet of closure on top of the Glen Dean limestone and covers an area of about 7 square miles.

The Benton pool is located on a north-plunging anticline of about 40 feet of closure on the top of the producing sand which is the Tar Springs sandstone. The producing area is bounded on the south on the highest part of the structure by tight sand, whereas on the north, east, and west the boundary parallels the structure contours. An exceptional condition was revealed in the Omaha pool where sills of igneous rock occur at several horizons, including that of the producing sand.

TABLE III
IMPORTANT DEEP TESTS IN ILLINOIS IN 1941

County	Pool or Wildcat	Location	Company and Farm No.	Total Depth (Feet)	Deepest Formation Tested	Top (Feet)	Remarks	Date Completed
Adams	Wildcat	12- 2S- 8W	Schachtsick—Reichart 1	901	St. Peter	820	Dry	5/20/41
Bond	Wildcat	28- 4N- 4W	Farrelly—Kyle 1	2,150	Devonian	2,115	Dry	5/ 6/41
Bond	Wildcat	21- 6N- 2W	Schwarz & Shell—Studebaker 1	3,206	"Trenton"	3,144	Dry	8/ 5/41
Bond	Wildcat	15- 6N- 2W	Texas—Mull 1	2,476	Devonian		Dry	7/15/41
Bond	Wildcat	1- 4N- 4W	Haines & Jackson—Hunter 1	2,539	Ste. Genevieve	2,420	Dry	3/ 4/41
Champaign	Wildcat	18-17N-11E	Union Products Petrol. Co.—Messman 1	1,850	"Trenton"	1,683	Dry	5/20/41
Champaign	Wildcat	18-22N- 8E	Robinson—Springer 1	1,404	"Trenton"	1,255	Dry	10/28/41
Christian	Wildcat	24-12N- 1W	Olson Drilling Co.—Tex 1	2,720	Devonian	2,540	Dry	6/10/41
Christian	Wildcat	26-15N- 2W	Marlow <i>et al.</i> —Howell 1	2,016	Devonian	1,915	Dry	7/29/41
Clark	Westfield	18-11N-14W	Harvey—Phillips 1	1,500	Devonian-Silurian		Dry	6/24/41
Clark	Wildcat	1- 9N-14W	Swan-King—Claypool	1,687	Devonian	1,622	Dry	12/16/41
Clay	Clay City Cons.	4- 2N- 8E	Pure—Moseley "B" 3	4,840	Devonian	4,669	Dry	10/21/41
Clinton	Wildcat	27- 3N- 1W	Obering <i>et al.</i> —Yantis 1	2,871	Devonian	2,802	Dry	4/ 8/41
Clinton	Wildcat	22- 1N- 5W	Gerson <i>et al.</i> —Billhart 1	3,217	"Trenton"	2,955	Dry	8/ 5/41
Coles	Wildcat	33-14N-10E	Allen & Sherritt—Taylor 1	1,143	Devonian		Dry	3/11/41
Coles	Wildcat	39-14N-10E	East Oakland Syndicate—Temple 1	2,290	"Plattin"	2,145	Dry	2/25/41
Crawford	Oblong	7- 6N-13W	Powers—Kirtland 1	3,110	Devonian	3,095	Dry	5/13/41
Douglas	Wildcat	33-16N- 9E	Illinois Mid-Continent—Bragg 1	700	Devonian		Dry	10/28/41
Dupage	Wildcat	2-40N- 9E	I.C.R.—Bartlett	1,175 ±	Franconia		Dry	12/30/41
Edgar	Wildcat	19-15N-13W	Leonard—Baker 1	900	Devonian	890	Dry	9/30/41
Fayette	Wildcat	13- 4N- 1W	Angelo-Twelve Oil Co.—Oates 1	3,056	Devonian	2,942	Dry	1/14/41
Fayette	Louden	16- 8N- 3E	Whisenant—Lilley 25-D	3,131	Devonian	3,063	1243BOF	5/27/41
Fulton	Wildcat	11- 7N- 1E	Lee Twp. Oil Co.—Walker 1	955	"Trenton"	953	Dry	5/13/41
Hancock	Wildcat	28- 4N- 5W	Tate—Rice 1	2,085	Dresbach		Dry	4/29/41
Jackson	Wildcat	9- 8S- 3W	Magnolia Petrol. Co.—Smith Heirs 1	3,893	"Trenton"	3,705	Dry	1/21/41
Johnson	Wildcat	24-11S- 3E	Benedum & Trees Oil Co.—Cavitt 1	4,250	Devonian	4,097	Dry	3/11/41

TABLE III (Continued)

County	Pool or Wildcat	Location	Company and Farm No.	Total Depth (feet)	Deepest Formation Tested	Top (feet)	Remarks	Date Completed
Knox	Wildcat	10-10N-3E	Davis—Byland 1	1,200	"Trenton"	967	Dry	6/3/41
Lawrence	Wildcat	20-3N-12W	Robinson—Sauers 1	5,013	"Trenton"	4,862	Dry	2/25/41
McLean	Wildcat	28-22N-1E	Funks Grove Oil & Gas Co.—Crawford 1	2,115	"Trenton"	1,995	Dry	5/27/41
Macoupin	Wildcat	1-9N-7W	Bridges <i>et al.</i> —Feiker 1	1,613	Devonian	1,505	Dry	4/1/41
Madison	Wildcat	27-5N-8W	Kiskadden—Fischer 1	1,955 ±	Devonian	1,945(?)	Dry	11/4/41
Madison	Wildcat	22-3N-6W	Wickwire <i>et al.</i> —Ellis 1	1,410	Devonian	1,363	Dry	2/11/41
Montgomery	Wildcat	28-9N-4W	Brown <i>et al.</i> —Luddeke 1	2,008	Devonian	1,970	Dry	5/20/41
Montgomery	Wildcat	10-9N-2W	Hoover—Battles 1	2,598	Devonian	2,519	Dry	5/20/41
Montgomery	Wildcat	20-10N-2W	Detrick—Banes 1	2,528	Devonian— Silurian	2,298	Dry	7/1/41
Montgomery	Wildcat	3-10N-2W	Benedum & Trees—Janssen Heirs	3,237	"Trenton"	3,144	Dry	8/19/41
Montgomery	Wildcat	28-9N-4W	Brown & Hager—Luddeke 1	1,810	Devonian		Dry	2/18/41
Morgan	Wildcat	2-13N-10W	Hunt—Cuddy 2	1,512	"Trenton"	1,380	Dry	4/15/41
Morgan	Wildcat	1-16N-11W	Measley <i>et al.</i> —Crum 1	1,200	"Trenton"	1,120	Dry	4/15/41
Morgan	Wildcat	28-13N-8W	Magnolia Petrol.—Keplinger 1	1,765	"Trenton"	1,585	Dry	9/9/41
Moultrie	Wildcat	31-14N-4E	Olson Drill. Co.—Ekiss 1	2,947	Devonian— Silurian	2,768	Dry	6/24/41
St. Clair	Wildcat	31-3S-6W	Alspach—Smith 1	1,715	Devonian	1,681	Dry	7/15/41
St. Clair	Wildcat	2-2S-0W	Magnolia Petrol.—Probst 1	1,450	"Trenton"		Dry	7/15/41
St. Clair	Wildcat	32-2N-7W	Morris—Rasp 1A	2,075	"Trenton"	1,947	Dry	10/14/41
St. Clair	Wildcat	26-1N-9W	Gass and Frazier—Hahn 1	1,500	"Trenton"	1,469	Dry	11/25/41
Scott	Wildcat	27-13N-13W	Bedell—Adams 1	1,050	St. Peter	875	Dry	3/25/41
Shelby	Wildcat	12-13N-3E	Olson Drill. Co.—Atkinson 1	2,922	Devonian	2,822	Dry	7/1/41
Shelby	Wildcat	36-13N-3E	O. C. Brunsfold—Harley-Yantis 1	3,061	Devonian	2,970	Dry	2/4/41
Vermillion	Wildcat	30-18N-13W	Sylvestre—Trisler 1	1,775	Devonian	1,428	Dry	6/10/41
Warren	Wildcat	11-9N-1W	Monarch Oil Co.—Hoadley 1	538	Devonian— Silurian		Dry	9/3/41
Washington	Wildcat	32-2S-4W	Bergundthal—Dement 1	2,395	Devonian	2,347	Dry	11/25/41
Clinton	Bartleso	9-1N-3W	Mosebach-Schlarmann 1	4,213	St. Peter	4,175	Dry	4/22/41
Fayette	Louden	21-8N-3E	Carter Oil Co.—Brauer 6D	4,679	St. Peter	4,421	Dry	11/24/41

RESULTS OF DEEP TESTING

Most of the deep drilling (see Table III) was located in counties west of the Illinois basin and there was little in the basin itself. The only deep test in the central part of the basin was the Pure Oil Company's Mosely No. 33, in the W. $\frac{1}{2}$, NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 4, T. 2 N., R. 8 E., Clay County, which tested the Devonian limestone in the Clay City field (top of Devonian limestone 4,669 feet; total depth, 4,840 feet). The well was deepened by cable tools from a former depth of 3,118 feet in the Ste. Genevieve limestone. At 4,820 feet the hole was bailed dry. Between 4,820 feet and the total depth of 4,840 feet, salt water containing hydrogen sulphide was encountered, which rose to a height of 1,400 feet in the hole. A sample analyzed by the Illinois Geological Survey had a total dissolved mineral content of 130,776 parts per million. No showings of oil or porosity were noted in the limestone down to the top of the Dutch Creek sandstone. This well was located about one mile west of the crest of the Clay City anticline, as indicated by structural data on the Glen Dean limestone. In the absence of even a showing of oil, the chances for oil in the Devonian limestone on this structure seem slight.

The St. Peter sandstone was tested in the Loudon field, Fayette County, by the Carter Oil Company's J. Brauer No. 6D, in the center of the SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 21, T. 8 N., R. 3 E. The total depth was 4,679 feet. The well was plugged back to 3,026 feet to produce from the Devonian limestone. Streaked oil-saturation was encountered in the Kimmswick ("Trenton") limestone from 3,842 to 3,943 feet. The top of the "Trenton" was at 3,824 feet. A drill-stem test recovered no oil. The top of the St. Peter sandstone was at 4,421 feet. A core from 4,464 to 4,486 feet consisted of 8 feet of tight sandstone overlying 13 feet of porous friable sandstone and had no oil-showing. A drill-stem test at this depth recovered 450 feet of muddy water and 3,950 feet of clear water.

Numerous tests to the Devonian and Trenton were drilled in the marginal areas west and north of the Illinois basin. Other noteworthy deep tests were a "Trenton" test in Jackson County, a Devonian test in Johnson County, and two on the LaSalle anticline in the Southeastern Illinois field, one to the Devonian in Crawford County and one to the "Trenton" in Lawrence County.

SOUTHWESTERN INDIANA

The following information on developments in southwestern Indiana was furnished by Ralph E. Esarey, State geologist, and Robert G. Reno, State gas supervisor, Indianapolis, Indiana.

During 1941, Indiana experienced a marked increase in drilling activity and prospecting over former years. Much of the development was concentrated in the southwestern part of the state which lies in the Eastern Interior coal basin. More than half of all wells drilled were located in Posey and Gibson counties, where the largest fields in the state have been opened in recent years. However, activity was widespread, with considerable core drilling and prospecting in the northern part, which includes the south flank of the Michigan basin. The old "Trenton" field of northeastern Indiana is receiving some attention as well as the Kankakee arch in the northwestern part.

During the year 552 wells were drilled, of which 411 were field locations and 141 were wildcats. This represents an increase of 32 wells over the year 1940. Of the field wells drilled, 260 were oil wells, 57 gas wells, and 94 dry holes. The wildcat wells included 16 oil wells that were potential pool openers or extensions, 3 commercial gas wells in the same area, and 122 dry holes. Approximately 25 per cent of all drilling was wildcat, with 11 per cent of it finding oil and 5 per cent gas.

Total production for the year will exceed 7 million barrels, which is the greatest since 1906. At the end of the year, 53 field wells and 34 wildcats were being drilled.

The Griffin field, in Gibson and Posey counties, continued to lead in drilling activity, with 157 completions. The field is practically defined on the east side and produces from five, or possibly six, pay zones, all of Chester or of Upper Mississippian age. The Devonian has not yet been tested. The total production for the field in 1941 is estimated in excess of 3 million barrels. The Ribeyre Island field, near New Harmony, second largest producer, reported only two completions during the year. An extension of the Heussler field, also in Posey County, was discovered and resulted in 11 new completions and 4 dry holes. It ranks third in the state as a producing area, with practically all oil coming from the Waltersburg and Tar Springs sands. Two new fields were discovered in Posey County during the year, in addition to some good prospects. The Mt. Vernon pool, T. 7 S., R. 14 W., was opened by the Carter Oil Company's W. D. Maier No. 1, which found saturation in the Waltersburg and Tar Springs. The initial test was reported as 1,000 barrels daily. Seven other producers and no dry holes have been drilled to date. The Lamott pool, in T. 7 S., R. 12 W., produced 55 barrels from the Tar Springs at about 1,950 feet. One additional well has been completed and one dry hole drilled in the area. One well in the Welborn-Switch area found commercial oil in the Cypress at 2,500 feet, with an initial production of 33 barrels. The second well

drilled was dry. To complete the operations in Posey County, 4 completions were made in the Vienna pool in the Mansfield sandstone, and the College field was enlarged by three producers in the Aux Vases sandstone.

In the Caborn field, the Tar Springs and Mansfield were opened as new pay zones with initial productions of more than 100 barrels.

Gibson County had the following discoveries during the year.

The Patoka field was opened by a 300-barrel well in the McClosky sand.

A possible extension of the Mt. Carmel field was opened by a 24-barrel producer on the Indiana side. Another good prospect is known as the Johnson field, where production was found in the Mansfield sandstone at 1,105 feet. The area is in Sec. 31, T. 2 S., R. 12 W. Considerable excitement resulted from the McClosky test near Hazelton which had a reported initial production of more than 200 barrels. A second completion has resulted and several new locations are started. North of Francisco, a new area was opened by the Brown-Creselius well which made 25 barrels on the first production test.

Vanderburgh County had one new pool opened, known as the Vernon pool, $\frac{1}{2}$ mile east of the Heussler field. Six completions have been made in the Mansfield sandstone, with initial flows of 25-30 barrels.

The Hatfield pool was opened in Spencer County, with the discovery well making approximately 100 barrels in the Waltersburg sand. The area is "spotty"; it has seven producers and several dry holes. Drilling was active prior to the new Federal spacing law.

The North Glendale gas field in Daviess County was opened and partly developed. There are now 7 producing wells in the Cypress, averaging more than 500,000 cubic feet daily, each.

Pike County has a good prospect, which may be a pool opener, in the Patberg No. 1 which was reported as making 65 barrels from the Cypress. The small town of Stendal is near by, the name of which will be used for the field.

The Laconia gas field, Harrison County, where production comes from the New Albany shale, had 6 completions and 3 dry holes.

Decatur County had 12 gas wells completed in the "Trenton," and Randolph County had 4 "Trenton" gas wells completed in the Unionport field. Exclusive of Decatur and Randolph counties, there were 13 gas wells, 1 oil well, and 7 dry holes drilled in the old "Trenton" field. An attempt is being made to revive the old Horton oil field in Hamil-

ton County, north of Indianapolis, where a 5-barrel "Trenton" well was completed.

Interest continues to grow in northern Indiana. A Devonian well, reported at 47 barrels, opened the so-called Elkhart field in Elkhart County, which has been disappointing so far.

The Anderson-Erb produced $\frac{1}{2}$ million cubic feet of gas from the "Niagara" or Lower Silurian, in the Old Francisville pool in Pulaski County. No further production has been found near the well.

In several other areas of the state small gas wells, showing prospects of new pools, were completed. In northern Indiana, core-testing and leasing has surpassed all other years. Large blocks of leases continue to be assembled and a few production tests have been made.

With increased wildcat drilling probably resulting from recent restrictions on drilling in pools, several new discoveries should be found in 1942.

WESTERN KENTUCKY

The following information on developments in western Kentucky was furnished by D. J. Jones, State geologist, Lexington, Kentucky.

Oil and gas development in Kentucky west of the Cincinnati arch for 1941 has decreased to some extent from that of the preceding year. Three hundred fourteen tests were reported, of which 153 were oil wells, 11 were gas wells, and 150 were dry holes as compared with 401 reported for 1940, of which 175 were oil wells, 10 were gas wells, and 216 were dry holes.

Production for the state, due to the discovery of no large flush pools, decreased to a level of 4,852,618 barrels as compared with 5,178,814 barrels for the year 1940.

New productive territory was confined largely to the extension of proved areas. The deepening of old producers resulted in some additional production in deeper pay zones.

An extension of the Legrande pool in Hart County resulted in new "Corniferous" production.

New discoveries in Union and Webster counties have increased interest in those counties. Production was found in sands of Pottsville age. These pools are in the early stages of development.

Completions were reported from 21 counties testing formations from Pennsylvanian to Lower Ordovician.

The sands of the Chester series have furnished most of the new production. These sands are found at shallow depths and offer an attractive play to the small company and individual operator.

The Devonian and Silurian beds, particularly in the shallow areas east and south of the western coal basin, have had some drilling activity. This territory, because of the shallow depth to the "Corniferous," offers an attractive play.

As a result of no showings of either oil or gas in any of the tests to the Knox dolomite in western Kentucky, there has been very little interest manifested in drilling to the deeper formations. Two tests to the Knox were reported.